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STUDIES IN NORTH AMERICAN HYPHOMYCETES—II¹

THE TRIBE OOSPOREAE

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(WITH PLATES 82-84 CONTAINING 28 FIGURES)

Lindau² includes in the tribe *Oosporeae* thirteen genera, as follows: *Sporendonema*, *Malbranchea*, *Glycophila*, *Oospora*, *Monilia*, *Oidium*, *Paepalopsis*, *Halobysus*, *Fusidium*, *Cylindrium*, *Polyscytalum*, *Geotrichum*, *Helicocephalum*.

The plants are small, inconspicuous, and parasitic or saprophytic. The mycelium is generally poorly developed and differs very little from the sporophores. The sporophores are short, lax or rigid. The hyaline or bright-colored spores are produced in chains endogenously or exogenously.

The genus *Sporendonema* was first described by Desmazieres³ with one species, *S. Casei*. This is generally considered congeneric with the so-called *Oospora Lactis* (Fres.) Sacc., and synonymous with *Oospora crustacea* (Bull.) Sacc. *Chalara mycoderma* Bon. is also cited as a probable synonym of *S. Casei*. Oudemans⁴ describes a new species, *S. terrestre*, and redescribes the genus. He transfers the type *S. Casei* to the genus *Torula*. One species has

¹ Studies in North American Hyphomycetes—I. was published in MYCOLOGIA 3: 45-56. March, 1911.

² Pflanzenfamilien 1¹** : 417. 1900.

³ Ann. Sci. Nat. I. 11: 246. 1827.

⁴ Archives Neerl. 20: 419. 1885.

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been reported from America, *S. myophilum* Sacc.⁵ This species was not available for study.

Glycophila, *Paecilopsis* and *Halobyssus* have not been reported from America. The first one has two species, the other two are monotypic.

The genus *Fusidium*⁶ is very indefinite and will require more extended study to determine its limits.

Cylindrium will be discussed under the genus *Polyscytalum*.

The genus *Helicocephalum* is monotypic and does not belong here. It is more closely related to the *Mucoraceae*.⁷

Hill⁸ gives the first description of the genus *Monilia*. It is quite interesting and seems worthy of reproduction here:

"*Monilia* is a genus of Fungi, consisting of a pedicle supporting a number of naked seeds, arranged together in series like the beads of a necklace.

"The *Monilia* all produce distinct male and female flowers. The male flowers are antherae, placed on short stamina, on the summit of the pedicle, or near the summit, surrounding it in form of fine powder. The female flowers we are able to distinguish nothing of, except the seeds which are arranged together in series, by means of a glutinous matter, and stand sometimes close to one another, sometimes more distinct. In some species these chains of seeds are laid along both sides of the summit of the stalks; in others they are wound round in clusters, and form a kind of tuberos knobs, which terminate it; in others they rise at distances from the very summit of the pedicle, in forms of fingers; and finally, in others they rise more numerous in this form, and near their bases, so as to form a kind of globule, with the extremities of several of the chains of seeds hanging down from them. These clusters of the series of seeds Micheli took for placentae; he also divided this genus into two, under the names of *Botrytis* and *Aspergillus* but the differences, this division is founded upon, are rather specific than generic; we have arranged them all together under one genus."

⁵ Ann. Rep. N. Y. State Mus. 41: 80. 1888.

⁶ Link, Berl. Mag. 3: 8. 1809.

⁷ Thaxter, Bot. Gaz. 16: 201. 1891.

⁸ Hist. of Plants 69. 1751.

Under this genus three species are enumerated: *M. capitata*, *divaricata*, *ramosa*. It is impossible to tell definitely what species Hill had before him.

The next general reference to this genus is given by Wiggers.⁹ Two species are listed: *M. crustacea* = *Mucor crustaceus* Linn. and *M. Aspergillus* = *Mucor Aspergillus* Scop.

Roth¹⁰ accepts the genus, cites Wiggers and enumerates *M. crustacea*, *cespitosa*, *aspergillus*, *nidulans*.

Persoon¹¹ gives *M. aurea*, *cespitosa aurea* = *Aspergillus* Mich.
2. He also adds the following species: *M. rosea*, *glauca*, *candida*, *racemosa*, *simplex*. In a later work¹² the same species are enumerated.

From these references it seems clear that the genus *Monilia* is congeneric with *Aspergillus* and *Penicillium* and should be retained in that group.

The other genera in this tribe will be discussed at more length in the following pages. No attempt is made to give all the probable synonyms. It was deemed advisable to divide some of the genera and make new genera in order to bring together the more closely related species.

Many of the types of this group are not available for study and in a number of cases are no longer in existence. The study of the species of this group must necessarily be based on descriptions.

OIDIUM Link, Berl. Mag. 3: 18. 1809

?*Alysidium* Kunze, Mykol. Hefte 1: 11. 1817. Type, *Alysidium fulvum* Kunze.

ORIGINAL DESCRIPTION: Thallus e floccis caespitosis, septatis, ramosis, decumbentibus; apicibus articulatis; articulis in sporidia secedentibus. Unica species, colore pulchre aureo.

Mycelium well developed, branched, septate, interwoven; sporophores erect or suberect, septate, simple or branched, rigid; spores produced in chains, hyaline or bright-colored.

Type species, *Trichoderma aureum* Pers.

⁹ Prim. Fl. Holsat. 111. 1780.

¹⁰ Tent. Fl. Ger. 1: 558. 1788.

¹¹ Tent. Disp. Meth. Fung. 40. 1797.

¹² Syn. Meth. Fung. 691. 1801.

This genus resembles *Rhinotrichum* in general appearance and in structure, but differs from that genus in the production of spores. In *Rhinotrichum* the spores are produced singly on the upper divisions of the sporophores, in *Oidium* the spores are produced in chains.

KEY TO THE SPECIES

Spores not over $30\ \mu$ long.

Pulvinate, spores $10-20\ \mu$ long.

Effused, spores $11-30\ \mu$ long.

Effused, spores $12-24\ \mu$ long.

Spores much larger.

1. *O. aureum*.

2. *O. simile*.

3. *O. Murrilliae*.

4. *O. megalosporum*.

1. OIDIUM AUREUM (Pers.) Link, l. c.

? *Alysidium fulvum* Kunze, l. c.

Torula aurea (Link) Corda, Icon. 2: 8. 1837.

Pulvinate or tufts sometimes confluent, floccose, yellow, tawny; mycelium creeping, septate, sending up erect or suberect sporophores; sporophores erect, simple or branched, septate; spores ovoid-ellipsoid, lemon-shaped, colored, $10-12 \times 16-20\ \mu$.

On decaying wood.

SPECIMENS EXAMINED: New Jersey, Ellis, N. A. F. 1647; Pennsylvania, Schweinitz.

In all probability *Monilia effusa* Peck¹³ belongs here.

2. OIDIUM SIMILE Berk. Jour. Bot. 4: 310. 1845

Oospora similis (Berk.) Sacc. Syll. Fung. 4: 23. 1886.

Monilia aureofulva Cooke & Ellis Grevillea 8: 12. 1886.

Effused, forming a dense mass over the substratum, yellow to reddish yellow; mycelium septate, interwoven; sporophores long, simple or branched, septate; spores in chains, globose or subglobose to ovoid, colored, variable in size, $11-20 \times 18-30\ \mu$.

On decayed wood.

SPECIMENS EXAMINED: Pennsylvania, Sumstine.

This species resembles *Rhinotrichum Curtisii* in general appearance. *Monilia aurantiaca* Peck & Sacc.¹⁴ is in all probability the same as this species.

¹³ Ann. Rep. N. Y. State Mus. 42: 128. 1889.

¹⁴ Ann. Rep. N. Y. State Mus. 42: 128. 1889.

3. *Oidium Murrilliae* sp. nov.

Effused, rather thick, powdery, yellow, melleous to ochraceous, at first white; mycelium densely interwoven, branching, septate; sporophores erect or suberect, short, septate; spores in short chains, sometimes branching, colored, irregularly shaped, ellipsoid to lemon-shaped, $12-14 \times 20-24 \mu$.

On decaying wood.

SPECIMENS EXAMINED: Mexico, near Cuernavaca, *W. A. and Edna L. Murrill*, 446 (type).

The type is in the herbarium of the New York Botanical Garden.

4. *OIDIUM MEGALOSPORUM* Berk & Curt. Jour. Linn. Soc. 1: 363.
1869

Monilia megalospora (Berk. & Curt.) Sacc. Syll. Fung. 4: 33.
1886. Not *Oidium megalosporum* Speg. Fungi Argentini 4:
122. 1881.

Pulvinate, growing in small tufts, sometimes several tufts confluent, powdery, yellow, pale yellow; mycelium scanty, branched, septate; sporophores very short; spores in short chains, globose or subglobose, granular within, very large, $35-45 \mu$, occasionally $50-70 \mu$.

On decayed wood.

SPECIMENS EXAMINED: Delaware, *Cummins*; Florida, *Calkins*; New Jersey, *Curtis*; New York, *Brown*, *Clinton*; Ohio, *Morgan*; Pennsylvania, *Sumstine*; West Virginia, *Sumstine*.

OOSPORA Wallr. Fl. Crypt. Ger. 2: 182. 1833

ORIGINAL DESCRIPTION: Sporidia subglobosa s. oriformia intricata pellucida, primum concatenata, hypham articulata simplicem teneram decumbentem mentientia, articulisque inter se facile secedentibus fragilia.

Mycelium scanty, more or less distinct from the sporophores, septate; sporophores thick, erect or decumbent, simple or branched, breaking into chains of spores, friable; spores variously shaped, concatenate, hyaline or bright-colored.

Type species, *Torula fructigena* Pers.

There is some doubt as to the identity of *Oospora candida*, but from the description it is probably a variety or a young stage of *Oospora fructigena* (*Torula fructigena* Pers.). This latter species is given as the second species under the genus, and, in case the former is not considered sufficiently clear to establish the genus, there can be no doubt as to the second species.

KEY TO THE SPECIES

Pinkish to brown.	1. <i>O. fructigena</i> .
Gray to ash-colored.	
Pulvinate.	2. <i>O. cinerea</i> .
Effused, spores $8-10 \times 10-12 \mu$.	3. <i>O. Cerasi</i> .
Effused, spores larger.	4. <i>O. Linhartiana</i> .
White or sordid white.	
Spores large, $15-23 \times 20-30 \mu$.	5. <i>O. fungicola</i> .
Spores small, $5-8 \mu$.	6. <i>O. Ar huri</i> .
Spores medium, $10-14 \mu$.	7. <i>O. Martinii</i> .

I. OOSPORA FRUCTIGENA (Pers.) Wallr. l. c.

Torula fructigena Pers. Obs. Mycol. 1: 26. 1796.

Monilia fructigena Pers. Syn. Fung. 693. 1801.

Oidium fructigenum Link Sp. Pl. 6¹: 122. 1824.

Pulvinate, sometimes confluent, white at first, then pink to brown; mycelium fasciculate, thin, septate; sporophores erect or suberect, simple or branched, dividing into chains of spores; spores ovoid, obovoid, or lemon-shaped, hyaline or colored, $10-12 \times 16-25 \mu$.

On various fruits, as apple, peach, plum.

SPECIMENS EXAMINED: Canada, *Thaxter*; New York, *Shear*; Ohio; Pennsylvania, *Sumstine*; South Carolina, *Ravenel*.

This fungus is known as the "brown rot" of fruit. It has been investigated by various students and its life history is fairly well known. It might more properly be treated under the perfect stage, *Sclerotinia fructigena* (Pers.) Schroet.

2. *Oospora cinerea* (Bon.)

Monilia cinerea Bon. Handb. Mykol. 76. 1851.

Pulvinate or effused, gray or gray-brown; mycelium branched, septate; sporophores short, erect, branched, breaking into spores;

spores concatenate, ellipsoid, irregular in shape, hyaline or light-colored, $10-12 \times 16-18 \mu$.

On cherries.

SPECIMENS EXAMINED: Pennsylvania, *Everhart*, 484.

This species is closely related to the preceding species. The spores are smaller and the tufts are not so large.

3. *Oospora Cerasi* (Tracy & Earle)

Monilia Cerasi Tracy & Earle, *Greene Pl. Baker.* 1: 35. 1901.

Effused, covering the entire fruit with a white coating, finally becoming ash-colored; mycelium developed in the fruit, branched; sporophores short, erect, branched, bearing the concatenate spores; spores spherical, lemon-shaped, hyaline or slightly colored, $10-12 \mu$.

On immature fruit of wild cherry.

SPECIMENS EXAMINED: Colorado, *Tracy* and *Earle*, 1083 (part of the original collection).

The effused growth and smaller spores distinguish this species from the two preceding species.

4. *Oospora Linhartiana* (Sacc.)

Monilia Linhartiana Sacc. *Syll. Fung.* 4: 34. 1886.

Effused, thin, gray-white, spreading along petioles and veins of leaves; mycelium scanty, septate, hyaline; sporophores short, simple or branched, with chains of spores; spores globose, subglobose or ellipsoid, $10-12 \times 12-18 \mu$.

On *Prunus* sp.

SPECIMENS EXAMINED: Canada, *Dearness*, 468; Maine, *Thaxter*; Wisconsin, *Stevens*.

The spore measurements given by Saccardo are somewhat larger than those given above.

5. *Oospora fungicola* (Ellis & Barth.)

Monilia fungicola Ellis & Barth. *Erythea* 5: 50. 1897.

Effused, thick, forming a felt-like coating, ashen-gray; mycelium hyaline, interwoven, branched, septate; sporophores erect, simple, short; spores in short chains, hyaline, ellipsoid, irregular, $15-23 \times 20-30 \mu$.

On *Lycoperdon giganteum*.

SPECIMENS EXAMINED: Kansas, *Bartholomew* (type).

6. *Oospora Arthuri* nom. nov.

Monilia candida Bon. Handb. Mykol. 76. 1851.

Tufted, confluent, white to yellow-white; mycelium well developed, branched, septate; sporophores erect, simple or branched, bearing the chains of spores; spores globose to ovoid, 5–8 μ .

On mucor culture.

SPECIMENS EXAMINED: Indiana, *Arthur*.

The type specimen grew on decayed wood. The specimen determined as this species agrees well with the original description.

It is regretted that the transfer of this species from one genus to another necessitates a new name. There is already an *Oospora candida*.

7. *Oospora Martinii* (Ellis & Sacc.)

Monilia Martinii Ellis & Sacc. *Michelia* 2: 376. 1880.

Effused or pulvinate, white with slight rosy tinge; mycelium creeping, scanty, septate; sporophores erect, septate, simple or branched; spores concatenate, globose or subglobose, irregular, colored, 10–14 μ .

On decayed rachis of *Zea Mays*.

SPECIMENS EXAMINED: Pennsylvania, *Martin*; Ohio, Fungi Columb. 1358.

Monilia sitophila (Mont.) Sacc. is said to be different in color and in the obtuse ends of the spores.

DOUBTFUL SPECIES

Monilia Peckiana Sacc. & Vogl. Syll. Fung. 4: 34. 1886. On *Vaccinium pennsylvanicum*. This is said to be near *Oospora Linhartiana*.

Oosporoidea gen. nov.

Mycelium scarcely differing from the sporophores, interwoven, crustaceous; the sporiferous hyphae breaking up into spores (?) or forming erect or suberect sporophores with hyaline or bright-colored concatenate spores.

Type species, *Oidium Lactis* Fres.

Oosporoidea Lactis (Fres.)

Oidium Lactis Fres. Beitr. Mykol. 23. 1851.

Oospora Lactis (Fres.) Sacc. Syll. Fung. 4: 15. 1886.

Effused, membranaceous, white, forming small patches, sometimes spreading for a considerable distance; mycelium interwoven, septate or simple; sporophores not sharply differentiated from the mycelium, erect or suberect, dividing into spores; spores in chains, irregular in shape and in size, frequently subglobose to ellipsoid, $5-7 \times 12-20 \mu$.

On cheese.

SPECIMENS EXAMINED: Pennsylvania, *Sumstine*.

Toruloidea gen. nov.

Mycelium scanty, simple or branched; sporophores erect or suberect, simple or branched; spores simple, formed in chains by the division of the sporophore, hyaline or bright-colored.

Type species, *Toruloidea effusa* Sumstine.

This genus is closely allied with *Torula*. The principal difference lies in the color of the spores; in *Torula* the spores are dark-colored, in *Toruloidea* hyaline or bright-colored. The genus is separated from *Oospora* by its delicate structure, less developed mycelium, and much smaller sporophores.

KEY TO THE SPECIES

Pale yellow to yellow.

Effused.

Pulvinate.

White to sordid white.

Spores globose or nearly so.

Spores ellipsoid to cylindrical.

Spores ovoid to obovoid.

1. *T. effusa*.

2. *T. Unangstii*.

3. *T. Nicotianae*.

4. *T. Tulipiferae*.

5. *T. candidula*.

1. Toruloidea effusa sp. nov.

Effused, thick, pale yellow to yellow, pulverulent; mycelium creeping, branched; sporophores short, erect, simple; spores in chains, ellipsoid, hyaline or subhyaline, usually with a short apiculus, $3-4 \times 4-6 \mu$.

On decayed wood. Bemus Point, N. Y.

SPECIMENS EXAMINED: New York, *Sumstine* (type).

The type specimen is in the herbarium of the Carnegie Museum, Pittsburgh.

2. **Toruloidea Unangstii** sp. nov.

Pulvinate, sometimes confluent, but usually in small patches, yellow; mycelium creeping, branched, filiform; sporophores erect, short, bearing long chains of spores; spores yellow, ovoid to ellipsoid, $2-3 \times 3-4 \mu$.

On decayed wood. Transfer, Pa.

SPECIMENS EXAMINED: Pennsylvania, *Sumstine* and *Unangst* (type).

Type specimen is in the herbarium of the Carnegie Museum, Pittsburgh, Pa.

3. **Toruloidea Nicotianae** (Pezz. and Sacc.)

Oospora Nicotianae Pezz. and Sacc. Syll. Fung. 14: 1037. 1899.

Pulvinate or effused, in small patches, white; mycelium filiform, creeping, branched, septate; sporophores short, erect; spores in chains, globose to ellipsoid, $2.5-3 \mu$.

On tobacco leaves.

SPECIMENS EXAMINED: Ohio.

The original description says the spores are papillate. The specimens examined did not show this character.

4. **Toruloidea Tulipiferae** (Ellis & Mart)

Oospora Tulipiferae Ellis & Mart. Amer. Nat. 16: 1004. 1882.

Thin, effused, white or slightly colored; mycelium subhyaline or light brown, septate; sporophores short, erect; spores hyaline or subhyaline, ellipsoid to cylindrical, concatenate, chains long, branched, $3-4 \times 7-9 \mu$.

On leaves of *Liriodendron*.

SPECIMENS EXAMINED: Pennsylvania, *Martin*.

The specimen examined is likely a part of the original collection, but it was not sufficient for a satisfactory examination. The plants grow on light brown spots on the leaves. A drawing on the label by Dr. Martin shows the chains of spores several times branched. The description here given is more or less compiled from the original.

5. *Toruloidea candidula* (Sacc.)

Oospora candidula Sacc. *Michelia* 2: 545. 1880.

Pulvinate or effused, white; mycelium creeping, branched; sporophores erect, simple or branched; spores in long chains, hyaline, ovoid or obovoid, $3 \times 5-6 \mu$.

On various substances.

SPECIMENS EXAMINED: New Jersey, *Ellis* and *Harkness*.

The specimen is in the New York Botanical Garden and marked *Oospora hyalinula* Sacc.

POLYSCYTALUM Riess. *Bot. Zeitung* 11: 138. 1853

ORIGINAL DESCRIPTION: Flocci erecti, subrigidi, ramosi; sporae simplices, cylindricae in catenas ramosas, ex floccorum ramorum-que apicibus natas seriatæ.

Mycelium wanting, or at least not differing from the sporophore; sporophores simple or branching, septate, hyaline or slightly colored; spores borne in chains at the ends of the sporophores, cylindric, obtuse at each end.

Type species, *Polyscytalum fecundissimum* Riess.

The difference between this genus and *Cylindrium* is based on the development of the mycelium. In the latter it is not so well developed. This distinction scarcely constitutes a generic difference and there seems no good reason for maintaining the two genera.

KEY TO THE SPECIES

White to subfuliginous.
White to sordid white.

1. *P. cylindroides*.
2. *P. sericeum*.

1. POLYSCYTALUM CYLINDROIDES Sacc. & Ellis *Jour. Mycol.* 4: 105. 1888

Tufts small, white to subfuliginous; sporophores a little incrassated from the base, subcylindric, subsimple; spores cylindric, obtusely rounded at each end, spuriously 1-septate, $2.5-3 \times 15-20 \mu$.

On fallen oak leaves.

SPECIMENS EXAMINED: New Jersey, *Ellis*, N. A. F. 2455.

This species is in all probability the same as the following.

2. POLYSCYTALUM SERICEUM Sacc. *Michelia* 1: 86. 1879

Effused or cespitose, white to sordid white; sporophores short or somewhat elongated, septate; spores concatenate, cylindric, ends obtuse, hyaline, $2.5-3 \times 15-18 \mu$.

On oak leaves.

SPECIMENS EXAMINED: Canada, *Harkness*; New Jersey, Fung. Columb. 1357; Pennsylvania, *Sumstine*.

GEOTRICHUM Link, Berl. Mag. 3: 17. 1809

ORIGINAL DESCRIPTION: Thallus e floccis caespitosis septatis, ramosis, decumbentibus. Sporadia ovalia, utrinque truncata, inspersa.

Mycelium scanty, floccose, septate, effused or cespitose; sporophores short, simple or branched; spores borne on the ends of the sporophores in chains, short cylindric, hyaline or light-colored.

Type species, *Geotrichum candidum* Link.

KEY TO THE SPECIES

Pulvinate, spores $5-12 \mu$ long.
Effused, spores shorter.

1. *G. candidum*.
2. *G. cuboideum*.

1. GEOTRICHUM CANDIDUM Link, l. c.

Small white tufts; mycelium scanty, creeping; sporophores erect, simple or branched, septate, hyaline; spores short cylindric, hyaline, $3-4 \times 5-12 \mu$; the length varies but the thickness is rather constant.

On various substrata.

SPECIMENS EXAMINED: New Jersey, *Ellis*.

2. *Geotrichum cuboideum* (Sacc. & Ellis)

Oospora cuboidea Sacc. & Ellis *Michelia* 2: 576. 1880.

Effused, forming a thin powdery coat over the substratum, white; mycelium branching, interwoven; sporophores erect, short; spores in chains, cuboid, irregular, $2-3 \times 3-4 \mu$.

On decaying wood.

SPECIMENS EXAMINED: New Jersey, *Ellis*. Probably part of the original collection.

MALBRANCHEA Sacc. *Michelia* 2: 638. 1880

ORIGINAL DESCRIPTION: Hyphae repentes, intricatae, continuae, hyalinae, v. laete coloratae, hinc inde in ramulos arcuatos abeuntes; ramuli seriatim plurinucleati, dein ex apice conidia cuboidea v. teretiuscula, continua, hyalina v. laete colorata exserentes.

Mycelium creeping, interwoven, branched, septate or continuous, hyaline, or bright-colored; sporophores short, suberect or arcuate, simple; spores in chains, formed endogenously within the extremities of the sporophores.

Type species, *Malbranchea pulchella* Sacc.

1. Malbranchea pulveracea (Ellis)

Monilia pulveracea Ellis; Craigin, Bull. Washburn Coll. 1: 69. 1884.

Rhinotrichum pulveraceum Ellis Jour. Mycol. 1: 47. 1885.

Effused, thin, pale yellow; mycelium branched, sparingly septate; sporophores short, suberect, simple or branched, with smooth swollen ends; spores in chains, formed within the swollen ends, globose or ellipsoid, $5-9\mu$ or $5-7 \times 5-12\mu$.

On dead wood and bark.

SPECIMENS EXAMINED: Kansas, *Ellis* and *Craigin*.

This species is placed in this genus with some hesitation. In some respects it agrees better with the genus *Glycophila*. The exact formation of spores could not be learned from the herbarium specimen. The original description says that the spores appear at first inside the swollen ends and push out through the investing membrane.

ACROSPORIUM Nees. Sys. Pilze 2: 14. 1817

ORIGINAL DESCRIPTION: Flocci simplices, aggregati, sursum moniliformes, articulis secedentibus inspersi.

Parasitic; mycelium scanty or well developed; sporophores lax, erect, simple, septate; spores produced in chains.

Type species, *Acrosporium monilioides* Nees = *Monilia hyalina* Fr.

This genus contains the conidial stages of the *Erysiphaceae*.

It seems desirable to retain this form-genus, since some of the forms have not yet been definitely associated with known species of the various genera of the *Erysiphaceae*.

Culture work on species of this genus is in progress, and, therefore, a mere enumeration of the species examined is given at present.

1. **Acrosporium hyalina** (Fr.).

Monilia hyalina Fr. Obs. Mycol. 1: 210. 1815.

Acrosporium monilioides Nees, l. c.

On various grasses. The conidial stage of *Erysiphe graminis* DC.

2. **Acrosporium obductum** (Ellis & Lang.).

Oidium obductum Ellis & Lang. Jour. Mycol. 6: 35. 1890.

On living leaves of young *Quercus*.

3. **Acrosporium Tuckeri** (Berk. & Br.).

Oidium Tuckeri B. & Br. Grev. 7: 28. 1878.

On vine leaves. Probably the conidial stage of *Uncinula necator* (Schw.) Burrill.

4. **Acrosporium leucoconium** (Desm.).

Oidium leucoconium Desm. Ann. de Sci. 13: 102. 1829.

The conidial stage of *Sphaerotheca pannosa* (Wallr.) Lév. There is a variation in the spelling of the specific name. The following spellings occur, *leuconium* and *leucogonium*.

6. **Acrosporium compactum** (Cooke & Ellis).

Oidium compactum Cke. & Ell. Grevillea 7: 39. 1878.

On *Quercus alba*.

7. **Acrosporium Euonymi-japonici** (Salmon).

Oidium Euonymi-japonici Salmon, Ann. Mycol. 3: 6. 1905.

No specimen of this species was seen but it is said to be near *A. leucoconium*.

8. **Acrosporium pirinum** (Ellis & Ev.).

Oidium pirinum Ellis & Ev. Jour. Mycol. 5: 68. 1889.

On leaves of *Pirus coronaria*.

9. *Acrosporium* sp.

? *Microsphaera Platani* Howe, Bull. Torrey Club 5: 4. 1874.

Amphigenous, white, effused, forming a dense stratum on the leaf; mycelium branched, interwoven; sporophores erect, simple, septate; spores smooth, ellipsoid, granular within, $25-27 \times 40-50 \mu$.

On leaves of *Platanus orientalis* L., Pittsburgh, Pa., August, 1912.

It attacks the young leaves usually and causes them to curl up and die. Unless checked it may become a dangerous shade tree disease.

10. *Acrosporium Gossypii* sp. nov.

Hypophyllous, white to sordid white, effused, thin, spreading over the leaf; mycelium branched, interwoven; sporophores erect, simple, dividing into spores; spores barrel-shaped, ellipsoid, truncate at the ends, $16-24 \times 40-50 \mu$.

On *Gossypium* sp. (Cotton). Kingston, Jamaica.

The type was collected by T. D. A. Cockerell and sent to me by Flora W. Patterson, of the Bureau of Plant Industry, Washington, D. C. It was labeled *Oidium erysiphoides*.

Oidium erysiphoides Fr.¹⁵ is a composite species. The name cannot be applied to any particular form of this genus but belongs to all the forms in general.

SPECIES REPORTED

The following species have been reported from North America, but no specimens were examined. They probably belong to the various genera described in this paper.

1. *Oidium albipes* Peck, Ann. Rep. N. Y. State Mus. 30: 57. 1878.

2. *Oidium Asteris-punicea* Peck, Bull. N. Y. State Mus. 150: 35. 1911.

3. *Oidium candidum* Schw. Trans. Amer. Philo. Soc. II. 4: 285. 1832. The type of this species has been lost and the description is too brief for determination.

4. *Monilia Harknessii* Peck, Ann. Rep. N. Y. State Mus. 34: 49. 1881.

5. *Monilia Avenae* Peck, Bull. Torrey Club 33: 219. 1906.

¹⁵ Syst. Mycol. 3: 432. 1829.

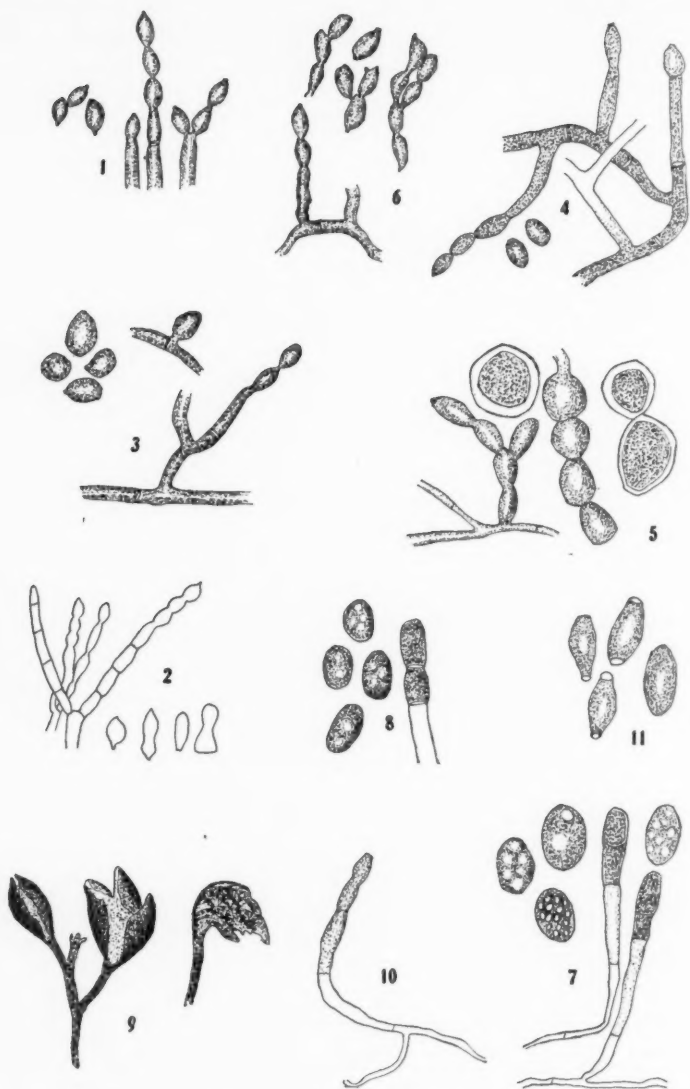
6. *Monilia viridi-flava* Cooke & Hark. Grevillea 9: 139. 1881.
7. *Monilia diffusa* Ellis & Ev. Jour. Mycol. 1: 44. 1885.
8. *Monilia Peckiana* Sacc. & Vogl. Syll. Fung. 4: 34. 1886.
This is said to be the same as *Monilia Linhartiana* Sacc.
9. *Monilia globosa* Schw. Trans. Amer. Phil. Soc. II. 4: 286. 1832. Type is lost.
10. *Oospora cucumeris* Peck, Ann. Rep. N. Y. State Mus. 41: 80. 1888.
11. *Oospora heterospora* Ellis & Ev. Bull. Torrey Club 24: 470. 1897. From the description this seems to belong to the genus *Toruloidea*.
12. *Torula pallida* Berk. & Br. Grev. 3: 14. 1873.
Oospora pallida (Berk. & Br.) Sacc. & Vogl. Syl. Fung. 4: 24. 1886. The type specimen was collected by Ravenel in South Carolina. It evidently is a *Toruloidea*.

EXCLUDED SPECIES

1. *Monilia rubiginosa* Peck, Ann. Rep. N. Y. State Mus. 30: 58. 1878. This has been transferred to the genus *Zygodesmus*.
2. *Monilia pencillata* Ellis & Ev. Jour. Mycol. 4: 54. 1888. This is now considered the same as *Chondromyces aurantiacum* (Berk. & Curt.) Thaxter.
3. *Monilia candida* Peck, Ann. Rep. N. Y. State Mus. 27: 106. 1875. This name is not tenable. The plant is likely the same as *Monilia mycophila* Sacc.
4. *Monilia punctans* Schw. Trans. Amer. Phil. Soc. II. 4: 286. 1832. The type is lost but the species should be referred to *Torula*.
5. *Monilia fusconigra* Schw. Trans. Amer. Phil. Soc. II. 4: 286. 1832. This is a *Torula*.
6. *Monilia urediniformis* Ellis & Ev. Proc. Acad. Nat. Sci. Phila. 461. 1893.
7. *Oidium inquinans* Schw. Trans. Amer. Phil. Soc. II. 4: 286. 1832. A *Torula*.
8. *Oidium corticale* Peck, Ann. Rep. N. Y. State Mus. 27: 105. 1875. A *Torula*.
9. *Oidium irregulare* Peck, Ann. Rep. N. Y. State Mus. 33: 29.

1891

1891



OIDIUM AND ACROSPORIUM

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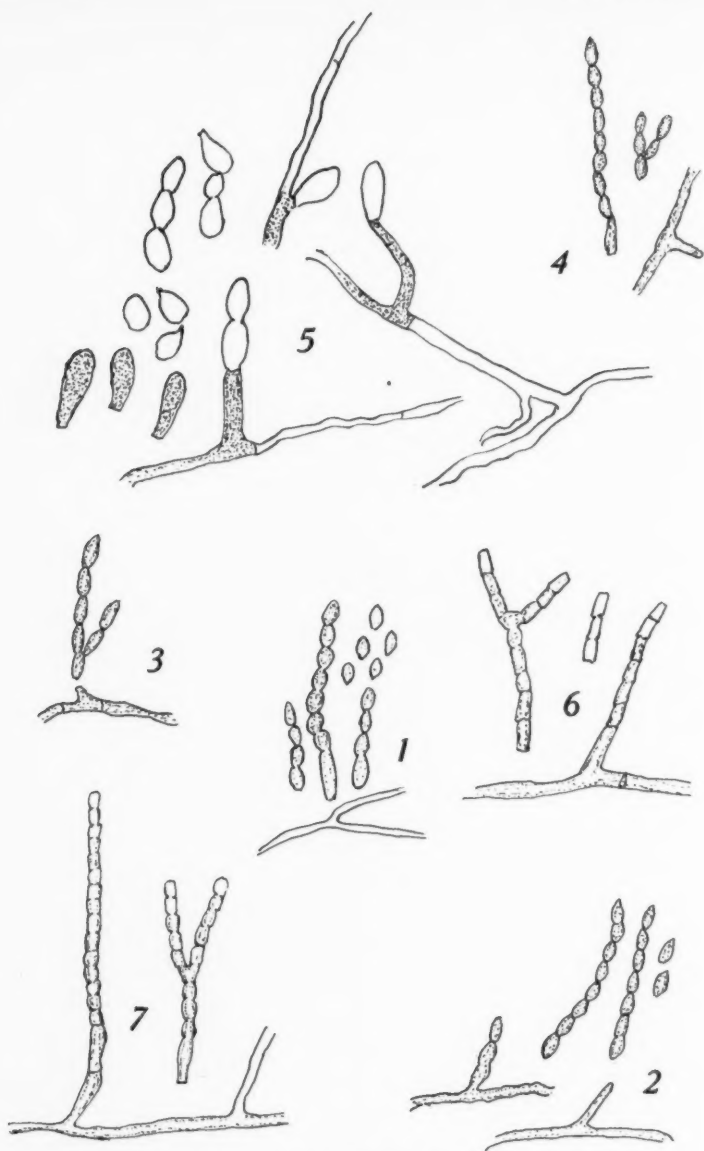
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OOSPORA

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GEOTRICHUM, MALBRANCHEA AND TORULOIDEA

1880. Saccardo has placed this in the genus *Ovularia* and made it synonymous with *O. isarioides*.

10. *Oospora scabies* Thaxter, Jour. Mycol. 7: 280. 1893. The first report of this species was in 1891.¹⁰ It very evidently does not belong to the genus *Oospora* as defined in this paper. I have not seen authentic specimens, but from the description it would seem better to establish a new genus for this species.

PEABODY HIGH SCHOOL,
PITTSBURGH, PA.

EXPLANATION OF PLATE LXXXII

All the figures on this and the following plates were drawn with the aid of the camera lucida and are highly magnified. The drawings show the mycelium, sporophores and spores.

1. *Oidium aureum* Link.
2. *Oidium simile* Berk. Reproduced from Jour. Bot. 4: 310. Pl. 12, fig. a, b.
- 3-4. *Oidium simile* Berk.
5. *Oidium megalosporum* Berk. & Curt.
6. *Oidium Murrilliae* Sumstine.
- 7-9. *Acrosporium* sp. 9 shows leaves of *Platanus orientalis*.
- 10-11. *Acrosporium Gossypii* Sumstine.

EXPLANATION OF PLATE LXXXIII

1. *Oospora fructigena* (Pers.) Wallr.
- 2-3. *Oospora Linhartiana* (Sacc.) Sumstine.
4. *Oospora cinerea* (Bon.) Sumstine.
- 5-7. *Oospora Martinii* (Ellis & Sacc.) Sumstine. 7 reproduced from *Fungi Ital.* 849.
8. *Oospora Arthuri* Sumstine
9. *Oospora fungicola* (Ellis & Barth.) Sumstine.
10. *Oospora Cerasi* (Tracy & Earle) Sumstine.

EXPLANATION OF PLATE LXXXIV

1. *Toruloidea effusa* Sumstine.
2. *Toruloidea Unangstii* Sumstine.
3. *Toruloidea Tulipiferae* (Ellis & Mart.) Sumstine.
4. *Toruloidea candidula* (Sacc.) Sumstine.
5. *Malbranchea pulveracea* (Ellis) Sumstine.
6. *Geotrichum candidum* Link.
7. *Geotrichum cuboideum* (Sacc. & Ellis) Sumstine.

¹⁰ Ann. Rep. Conn. Agric. Ex. Station 81. 1891.

TYPE STUDIES IN THE HYDNACEAE—IV.¹ THE GENUS PHELLODON

HOWARD J. BANKER

Phellodon niger (Fries) P. Karst. Rev. Myc. 3¹: 19. 1881
Hydnum nigrum Fries, Obs. Myc. 1: 134. 1815.

No specimen was found at Upsala that could be regarded with certainty as the type of the species. Specimens under this name in the herbarium presented considerable diversity of characters. A specimen from Karsten collected in 1866 may be considered from its date as having its determination at least approved by Fries. This specimen appears identical in every respect with the American forms which we have referred to the Friesian species² and we, therefore, believe that we have rightly interpreted the species.

***Phellodon amicus* (Quél.)**

Hydnum amicum Quél. Grev. 8: 115. 1880.
Hydnum vellereum Peck, Rept. N. Y. State Mus. Nat. Hist. 50: 110. 1897.

The type specimen of *H. amicum* Quél. could not be located, but at Paris authentic specimens from Quélet were found which appeared to be identical in all characters with the American *H. vellereum* Pk.

***Phellodon pullus* (Schaeff.)**

Hydnum pullum Schaeff. Fung. Bavar. 4: 98. pl. 272. 1774.
Hydnum zonatum Gmelin, L. Syst. Nat. 2: 1438. 1796.
Hydnum melaleucum Fries, Obs. Myc. 1: 141. 1815.
Hydnum leptopus Pers. Myc. Eur. 2: 170. 1825.
Hydnum graveolens Delast. Fries, Epicrisis 509. 1836-38.

There is, of course, no type specimen of *Hydnum pullum* Schaeff., and our understanding of the species is based chiefly on

¹ Investigation prosecuted with the aid of a grant from the Esther Herrman Research Fund of the New York Academy of Science.

² Mem. Torrey Club 12: 166.

Schaeffer's description and figures. These conform in all respects to the American plants which we have placed in this segregation. In Persoon's herbarium at Leyden are a number of specimens labelled in Persoon's handwriting "*Hydnum pullum* Schaeff." These are typical specimens of our form.

In Fries's herbarium there is no true type specimen of *H. melaleucum* Fr., but the specimens there placed under this name include plants collected as early as 1866 in Upsala by Th. Fries and in Mustiala by P. A. Karsten. These are seemingly identical with our plants. Fries also regarded *H. pullum* Schaeff. as a synonym of his species.³ The lack of odor noted by Fries is a character on which we think too much stress may be laid. Our plants yield more or less odor.

There are several specimens in Persoon's herbarium labelled "*Hydnum leptopus*," some of these in Persoon's handwriting. They are nearly all typical plants of this segregation. Fries regarded Persoon's species as a synonym of *H. graveolens* Delast.⁴

There appears to be no type of *H. graveolens* Delast. at Upsala. The only specimens found there referred to Delastre's species were in Starbuck's collection from Sweden and these forms approached more closely to our conception of *Phellodon amicus* (Quél.). At Kew similar forms were commonly referred to *H. graveolens* Delast. Fries's description of *H. graveolens* Delast. also points in some respects to the *amicus* type, particularly his emphasis upon the word *molli* in his description of the character of the pileus. In fact, it might reasonably be claimed that in Fries's conception *H. graveolens* Delast. includes the forms here treated as *Phellodon amicus* (Quél.), in which case the name *graveolens* should prevail for these plants as being the older name. By any other interpretation it is difficult to understand how Fries conceived any difference between *H. graveolens* Delast. and *H. melaleucum* Fr. On the other hand his figure of *H. graveolens* Delast. in his *Icones Selectae Hymenomycetes* pl. 6. f. 1 is much more nearly our conception of *P. pullus* (Schaeff.) than of *P. amicus* (Quél.). Moreover, it appears to have been Delastre's idea of the species. In Persoon's herbarium at Leyden is a speci-

³ Fries, *Syst. Myc.* 1: 406. 1821.

⁴ Fries, *Epicr. Myc.* 510; *Hym. Eur.* 616.

men received from Delastre and marked by the latter "graveolens," which is identical in character with the plants that we have regarded as typical of the present segregation. Two other specimens received from Delastre and marked "hydnum fragrans Dtr" are of precisely the same character. In Fries's herbarium at Upsala is a specimen undoubtedly received from Delastre, which is marked "hydnum fragrans. 29 Dstre. 1823. hydnum leptopus var. v. graveolens Pers. Myc. Eur. Sect. 2. p. 171." This is apparently Delastre's hand. In one corner of the label is written in a different hand "graveolens Hym. Eur. p. 606." It seems highly probable that this specimen should be regarded as the type of *H. graveolens* Delast. as published by Fries in *Epicr. loc. cit.* The specimen has the characters of the forms here considered except the upper surface of the pileus is more pubescent, in this respect approaching the character of *P. amicus* (Quél.).

The two species, *P. amicus* (Quél.) and *P. pullus* (Schaeff.), as we have defined them, are closely connected by intermediate forms, and it seems altogether probable that Fries based *H. graveolens* Delast. on some such intermediate form as the one cited above from Delastre and now at Upsala. As a consequence, there has arisen the prevailing confusion concerning the latter species. It is difficult from the evidence at hand to decide in which of the two segregations *H. graveolens* Delast. ought to be included. On the basis of Fries's figure and Delastre's specimens we consider the species as synonymous with *P. pullus* (Schaeff.). Opposed to this, however, is the fact that *H. melaleucum* Fr. is unquestionably a synonym of *P. pullus* (Schaeff.), and Fries distinctly asserts that *H. graveolens* Delast. is distinct from *H. melaleucum* Fr. The only point of difference that he mentions that seems to have any weight is the softer substance attributed to *H. graveolens*. This is the character that points toward *P. amicus* (Quél.).

PHELLODON TOMENTOSUS (L.) Banker, Mem. Torr. Club 12:
171. 1906

Hydnum tomentosum L. Sp. Pl. 2: 1178. 1753.

Hydnum cyathiforme Schaeff. Fung. Bavar. 4: 93. pl. 139. 1763.

There is no type of either the Linnaean or the Schaefferian

species in existence. Thanks to the excellent figures of Schaeffer there has never been much confusion as to the forms intended to be included in his species, and they have been more generally known by his name. The Linnaean species has been less clearly understood on account of the very brief diagnosis and the lack of any figure. Nevertheless there appears to be only the one known European species to which his description can apply.

Fries treated these forms as *H. tomentosum* L. in all of his earlier work, but in *Hymenomycetes Europaei* 606 he rejected the Linnaean name, substituting the name of Schaeffer on the ground that the Linnaean species had the pileus tomentose, while in these forms the disk was only slightly villose or altogether glabrous.⁵ While there is some truth in Fries's comment, we believe that he has given it too much weight. It is true that the dark central disk of these forms is often nearly or quite glabrous but not always. Moreover, the whitish or light colored border of the pileus is always quite densely woolly tomentose. In the herbarium at Upsala a specimen was found labelled as follows: "*Hydnum tomentosum* L. Upsala Sunnerstackog. 1851. E. P. Fries." At first we took this specimen from its dark uniform chestnut or bay color to be a *Hydnellum* rather than a *Phellodon*. It was only by a careful examination of the teeth and especially the spore characters that we became convinced that it was a *Phellodon*, and a representative of the present segregation in which the dark character of the central disk had spread quite to the margin, practically obliterating the usual whitish tomentose border. It may have been such an extreme form that induced Fries to abandon the Linnaean name.

***Phellodon carnosus* sp. nov.**

Hymenophore terrestrial, mesopodous, solitary, light colored, medium size; pileus expanded, plane to subconvex, slightly depressed, subround to irregular, 3-4 cm. wide, 1 mm. thick; surface uneven to nearly even, light grayish brown at center with subpuberulent whitish or cream colored border about 3-4 mm. wide, azonate; margin thin, sterile, incurved in drying; substance

⁵"Ad hanc speciem manifeste non pertinet *H. tomentosum* Linn., sed pileo tomentoso ad antecedentia (i. e. *H. melaleucum*). *H. cyathiforme* disco leviter modo villosum l. omnino glabrum." Fries, *Hym. Eur.* 606.

fleshy, brittle, homogeneous, slightly zonate, pale brown, darker toward base of stem; stem stout, subcylindrical, somewhat abruptly attenuate at base, glabrous or subpuberulent, light to pallid at top, becoming brownish toward base, 2-3 cm. long by 0.5-1 cm. wide, solid, consubstantiate with pileus; teeth short, stout, terete, tapering, acute, shortening toward stem and margin, almost snow white when fresh, becoming whitish to ash-gray in drying, 2 mm. or less long by 0.25-0.35 mm. wide, 5-8 in a sq. mm., somewhat decurrent as papillae; spores hyaline, subglobose, minutely echinulate, $3.5-4 \times 4-5 \mu$ wide; hyphae of trama hyaline, smooth, thin-walled, collapsing when dried, recovering in KOH, running parallel and interweaving closely, but separating with some difficulty in KOH, slender, often irregularly contorted and uneven, septate without clamp-connections, segments long, irregular, $4-10 \mu$ wide, branching diffuse, interseptate; odor faint, pleasant; taste mild.

On the ground in coniferous woods; late summer.

The type specimens are in the author's herbarium and were collected along the side of Bleeker pond near Gloversville, N. Y. Specimens of the same species have been collected in Vermont by Burlingham and are in the New York Botanical Garden Herbarium.

This is the most remarkable species in this genus. Its fleshy substance is a radical departure from the usual characters of the species included here. At first it seemed to demand the recognition of a distinct generic type, but the spore characters, the coloration, and even the peculiar odor of the plants pointed so strongly to affinity with the *Phellodons* that it seemed best to extend the boundaries of the genus so as to include this form at least for the present. Aside from its fleshy substance, it appears to be in every way a *Phellodon*.

DE PAUW UNIVERSITY,
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NEW SPECIES OF FUNGI¹

CHAS. H. PECK

Amanita peckiana Kauffm., in litt.

Pileus at first ovate, becoming broadly convex or nearly plane, glabrous at first then fibrillose or somewhat scurfy with minute adnate pinkish or cream-colored squamules, white, not striate, the margin at first incurved and bordered by the thickish union of the universal and partial veil, at length crenate-fringed or lacerate-appendiculate, flesh firm, thickish, white; lamellae free, reaching the stem, moderately broad, much broader in front, subellipsoid, pure-white, flocculose on the edge; stem stout, tapering upward, stuffed or hollow, bulbous, the bulb covered by a thick, firm, loose volva margined with ovate lobes, the flesh often pinkish or salmon-colored, especially toward the base, annulus evanescent, but in the young plant the lamellae are concealed by the very thin inner veil; spores oblong, elongated or subcylindric, obtuse, $12-16 \times 5-7 \mu$, sometimes slightly narrowed toward one end.

Pileus 5-9 cm. broad; stem 5-9 cm. long, 1-2 cm. thick.

Sandy soil under white pine trees, *Pinus strobus* L. New Richmond, Michigan. September. C. H. Kauffman.

An interesting and very distinct species, well marked by the thin, evanescent inner veil and the oblong or subcylindric spores.

Pileus subovatus, obtusus, deinde late convexus vel subplanus, primum glaber, deinde fibrillosus vel minute furfuraceus, albus, non striatus, primum margo incurvus et velis universali imperfectoque incrassatus, demum crenate-fimbriatus vel lacerate-appendiculatus, carne firmo, subcrasso, albo; lamellae liberae, attingentes, sublatae, anteriore latiores, subellipsoideae, candidae, acie flocculosae; stipes validus, deorsum attenuatus, farctus vel fistulosus, bulbosus, bulbo volva crassa, firma, laxa tecto, ovatis lobis marginata, carne saepe infra subincarnate, annulo evanescenti, lamellae juveniles velo tenui tectae; sporae oblongae, elongatae vel subcylindraceae, obtusae, $12-16 \times 5-7 \mu$, aliquando leviter infra attenuate.

¹ Previous articles in this series were published in the *Bulletin of the Torrey Botanical Club*. The form there used is retained.

Collybia subdecumbens

Pilus thin, submembranous, convex or broadly convex, glabrous, grayish-brown or blackish-brown; lamellae thin, subclose, arcuate, adnate, variable in color, whitish-cinereous or tinged with pink; stem straight or nearly so, abruptly bent and decumbent at the base, often compressed and sometimes canaliculate, stuffed or hollow, white, shining; spores ellipsoid, $10.5 \times 4 \mu$.

Pileus 1-3 cm. broad; stem 4-7 cm. long, 2-5 mm. thick.

Among fallen oak leaves. Stow, Massachusetts. November. S. Davis.

Pileus tenuis, submembranus, convexus vel late convexus, glaber, griseo-brunneus vel nigrescente-brunneus; lamellae tenues, subconfertae, arcuatae, adnatae, in colore variabiles, albiae, cinereae vel subincarnatae; stipes rectus vel subrectus, basi abrupte decumbentus, saepe compressus, aliquando canaliculatus, farctus cavusve, nitidus, albus; sporae ellipsoideae, $10.5 \times 4 \mu$.

Collybia truncata

Pileus thin, conic or subcampanulate, prominently umbonate, with a truncate umbo, subfibrillose, rarely rimosely areolate, grayish-brown or reddish-brown; lamellae rather broad, subventricose, subdistant, adnexed, whitish or subcinereous, becoming reddish where bruised; stem equal, flexuous, fibrillose, stuffed or hollow, radicaing, colored like the pileus; spores subglobose or broadly ellipsoid, $6-8 \times 5-6 \mu$.

Pileus 2-3 cm. broad; stem 2.5-4 cm. long, 1.5-2.5 mm. thick.

Pine woods. Stow, Massachusetts. November. S. Davis.

Remarkable for its radicaing stem, truncate umbo and change of color assumed by the wounds.

Pileus tenuis, conicus vel subcampanulatus, prominente umbonatus, umbone truncato, subfibrillosus, rare rimose areolatus, griseo-brunneus vel rufescente-brunneus; lamellae sublatae, subventricosae, subdistantes, adnexae, albiae subcinereaevae, obtusis rufescentibus; stipes aequalis, flexuosus, fibrillosus, farctus cavusve, radicaing vel basi decumbens, pileo in colore similis; sporae subglobosae vel late ellipsoideae, $6-8 \times 5-6 \mu$.

Entoloma mirabile

Pileus conic or subcampanulate, with a prominent umbilicate umbo, thin, submembranous, minutely furfuraceous or subsquamulose, blackish-brown; lamellae arcuate, adnate, subdistant,

whitish becoming pink; stem somewhat flexuous, equal, fibrillose, hollow, sometimes compressed and canaliculate, brown, a little paler than the pileus, with white mycelium at the base; spores subglobose, angular, $10-12\mu$ in diameter, commonly uninucleate.

Pileus 2-3 cm. broad; stem 3-5 cm. long, 2-4 mm. thick.

Swamps under maple trees. Stow, Massachusetts. August. S. Davis.

The species is remarkable for its somber coloring and its prominent umbilicate umbo.

Pileus conicus subcampanulatusve, umbonatus, umbone umbilicato, tenuis, submembranus, minute furfuraceus subsquamulosusve nigrescente brunneus; lamellae arcuatae, adnatae, subdistantes, albidae, incarnatescentes; stipes subflexuosus, aequalis, fibrillosus, fistulosus, aliquando compressus et canaliculatus, brunneus, leviter pileo pallidior, cum mycelio basi albo; sporae subglobosae, angulares, $10-12\mu$ in diameter, vulgo uninucleatae.

Inocybe minima

Pileus conic-convex or nearly plane, membranous, minutely fibrillose, sometimes umbonate, fragile, inrolled and sometimes split on the margin, tawny-brown; lamellae subdistant, adnate, entire on the margin, pale-tawny-brown becoming darker with age; stem slender, equal, solid, pallid; spores subellipsoid, even, $8-10 \times 4-5\mu$, cystidia flask shape, $72-80 \times 20-25\mu$.

Pileus 8-12 mm. broad; stem 1-1.5 cm. long, 1-1.5 mm. thick.

Gregarious. Gravelly soil by roadside. South Acton, Massachusetts. August. S. Davis.

Remarkable for its small size. It is referable to the section *Lacerae*.

Pileus conicus convexus vel subplanus, membranous, minute fibrillosus, subumbonatus, fragilis, margine involutus et aliquando rimosus, fulvo-brunneus; lamellae subdistantes, adnatae, aciei integrae, pallide fulvo-brunneae, in senectute umbrinae; stipes gracilis, aequalis, solidus, pallidus; sporae subellipsoideae, leves, $8-10 \times 4-5\mu$, cystidia laguncularia, $72-80 \times 20-25\mu$.

Leptonia gracilipes

Pileus thin, membranous, hemispheric-convex or nearly plane, minutely papillate becoming umbilicate, subscabrous, hygrophanous, striatulate when moist, striate when dry, blackish-brown when young, becoming paler with age; lamellae ascending or

arcuate, adnexed, white at first, then pale-flesh-color; stem equal or slightly tapering upward, slender, hollow, glabrous, mouse-gray, becoming blackish in drying, often with white mycelium at the base; spores incarnate, angular, uninucleate, apiculate, $8-10 \times 6-7 \mu$.

Pileus 1-2 cm. broad; stem 2-4 cm. long, 1-1.5 mm. thick.

In a wood road. Stow, Massachusetts. August. S. Davis.

Pileus tenuis, membranous, hemisphaericus convexus vel subplanus, minute papillatus, demum umbilicatus, subscaber, hygrophanus, humidus striatulus, siccus striatus, in juventate nigrescente-brunneus, in senectute pallidor; lamellae ascendentes vel arcuatae, adnexae, primum albae, deinde pallide incarnatae; stipes aequalis vel deorsum leviter attenuatus, gracilis, fistulosus, glaber, murinus, in siccitate nigrescens, saepe basi albido mycelio; sporae incarnatae, angulares, uninucleatae, apiculatae, $8-10 \times 6-7 \mu$.

Leptonia validipes

Pileus thin, membranous, convex, slightly depressed in the center or subumbilicate, fragile, minutely squamulose, dark-gray or grayish-brown; lamellae thin, close, entire on the margin, adnate, white and smooth becoming pink and dusted by the spores; stem stout but fragile, pruinose above, flexuous, hollow, sometimes twisted, often bent at the base, pale-violet-gray above, white below with white mycelium at the base; spores angular, apiculate, uninucleate, $10-12 \times 6-8 \mu$.

Pileus 2-3 cm. broad; stem 3-6 cm. long, 2-3 mm. thick.

Gregarious. On humus in swamps. Stow, Massachusetts. August. S. Davis.

This may possibly prove to be a large stout-stemmed form of *Leptonia gracilipes* Pk. but the description of the collector attributes no striations to the pileus of the fresh plant. This would afford a ready mark of distinction between the two species.

Pileus tenuis, membranous, convexus, in centro leviter depressus vel subumbilicatus, fragilis, minute squamulosus, nigrescente griseus vel griseo-brunneus; lamellae tenues, confertae, aciei integrae, adnatae, albae glabraeque, deinde incarnatae; stipes validus, fragilis, supra pruinosis, flexuosus, fistulose, aliquando contortus, saepe basi recurvus, supra pallide griseo-violaceus, infra albus, basi album mycelium; sporae angulares, apiculatae, uninucleatae, $10-12 \times 6-8 \mu$.

Puccinia striatospora

Spots none; sori epiphyllous or somewhat amphigenous, orbicular, prominent, commonly 1-2 mm. broad, sometimes small, numerous and gregarious, rusty-brown; spores oblong, obtuse, usually slightly constricted at the septum, $35-40 \times 20-25 \mu$, the cells longitudinally striated.

Living leaves of *Heuchera cylindrica* Dougl. Bridge Creek near Chelon Lake, Washington. July. M. E. Jones.

An interesting species, remarkable for and easily distinguished by the striated spores.

Maculae nullae; sori epiphylli vel subamphigeni, orbiculares, prominentes, vulgo 1-2 mm. lati, aliquando parvi, numerosi, gregarii, fulvi; sporae oblongae, obtusae, vulgo ad septum leviter constrictae, $35-40 \times 20-25 \mu$, loculi in longum striati.

GEOLOGICAL HALL,

ALBANY, NEW YORK.

THE AMANITAS OF EASTERN NORTH AMERICA

WILLIAM A. MURRILL

(WITH PLATES 85 AND 86)

So much has been written on this important group of gill-fungi, both in Europe and America, that it is difficult to review in a brief paper the various opinions that have been held and the numerous discussions that have arisen regarding the identity, variability, distribution, and properties of the species it comprises. My present object is rather to list the chief eastern North American species, with a few of the names under which they have been known, and to add brief notes that students may appreciate. No reference is made here to the poisonous or edible properties of the individual species, as it is the opinion of the writer that the entire group should be strictly avoided by the mycophagist. After reading the following paper it may perhaps be more easily understood why this statement is made. Aside from the great variations in certain species, the accidental loss of a delicate structure like the veil may entirely remove a specimen from a dangerous genus and transfer it to one in which all the known species are harmless.

VENENARIUS Earle, Bull. N. Y. Bot. Gard. 5: 450. 1909

The type of *Amanita* is *Agaricus campestris*, hence this familiar generic name must be discarded.

Volva free, conspicuous, persistent; stipe not bulbous.

Volva wide; lamellae yellow; pileus red, orange, or yellow.

1. *V. Caesareus*.

Volva narrow; lamellae white; pileus white or brown.

2. *V. spratus*.

Volva adnate to the base of the bulbous stipe, limb free, usually persistent; pileus white or variously colored, smooth or with few patches.

3. *V. phalloides*.

Volva ocreate, usually marginate; pileus covered with remnants of the volva.

Pileus 3-7 cm. broad, white or tinged with yellow or olive.

4. *V. cothurnatus*.

- Pileus 8-10 cm. broad, umber-brown, sometimes tinged with yellow. 5. *V. velatipes*.
- Volva fragile, adnate to the pileus and stipe as warts, patches, or scales; pileus rarely smooth from the first, often becoming smooth with age.
- Flesh at length staining reddish when wounded; pileus usually dull-reddish. 6. *V. rubens*.
- Flesh not staining reddish when wounded.
- Pileus dark-brown, smooth from the first, margin not striate. 7. *V. Morrisii*.
- Pileus orange to yellow, 8-20 cm. broad; stipe usually rough, with concentric, margined scales adnate to the bulbous base. 8. *V. muscarius*.
- Pileus chrome-yellow to orange-yellow, 3-8 cm. broad; stipe slender, smooth, with remnants of the fragile, yellowish volva at the base. 9. *V. Frois ianus*.
- Pileus flavous with a melleous tint to dark-brownish-melleous, 6-10 cm. broad; stipe tomentose to floccose-scaly, reddish below, especially when bruised; volva yellow, fragile. 10. *V. flavorubescens*.
- Pileus pale-yellow, 4-5 cm. broad, tuberculate-striate on the margin; stipe smooth, glabrous; volva fragile, subappressed to the bulbous base. 11. *V. russuloides*.
- Pileus whitish or grayish tinged with yellow, with peculiar white, webby patches; stipe floccose, mealy above; volva slight, evanescent. 12. *V. crenulatus*.
- Pileus white to grayish or murinous, pulverulent, warty, or spiny; stipe bulbous or radicate; odor often strong, resembling chlorine. 13. *V. solitarius*.

1. *Venenarius Caesareus* (Scop.)

Agaricus Caesareus Scop. Fl. Carn. ed. 2, 2: 419. 1772.

Amanita Caesarea Pers. Syn. Fung. 252. 1801.

Amanita pellucida Banning & Peck, Ann. Rep. N. Y. State Mus. 44: 66. 1892. (Type from Maryland.)

Described from Europe, and found in woods from New England to Alabama and west to Ohio.

2. *Venenarius spretus* (Peck)

Agaricus (Amanita) spretus Peck, Ann. Rep. N. Y. State Mus. 32: 24. 1879.

Described from Sandlake, New York, and found in open or bushy places in the eastern United States from Maine to Alabama.

American specimens determined as *Amanita recutita* Fries doubtless belong in this category.

3. *VENENARIUS PHALLOIDES* (Fries) Murrill, *Mycologia* 4: 240. 1912

Agaricus phalloides Fries, *Syst. Myc.* 1: 13. 1821.

Amanita floccocephala Atk. *Stud. Am. Fungi* 62. 1900. (Type from Ithaca, New York.)

Amanita lignophila Atk. *Ann. Myc.* 7: 366. 1909. (Type from Ithaca, New York.)

Amanita bisporigera Atk. *Bot. Gaz.* 41: 348. f. 1-17. 1906. (Type from Ithaca, New York.)

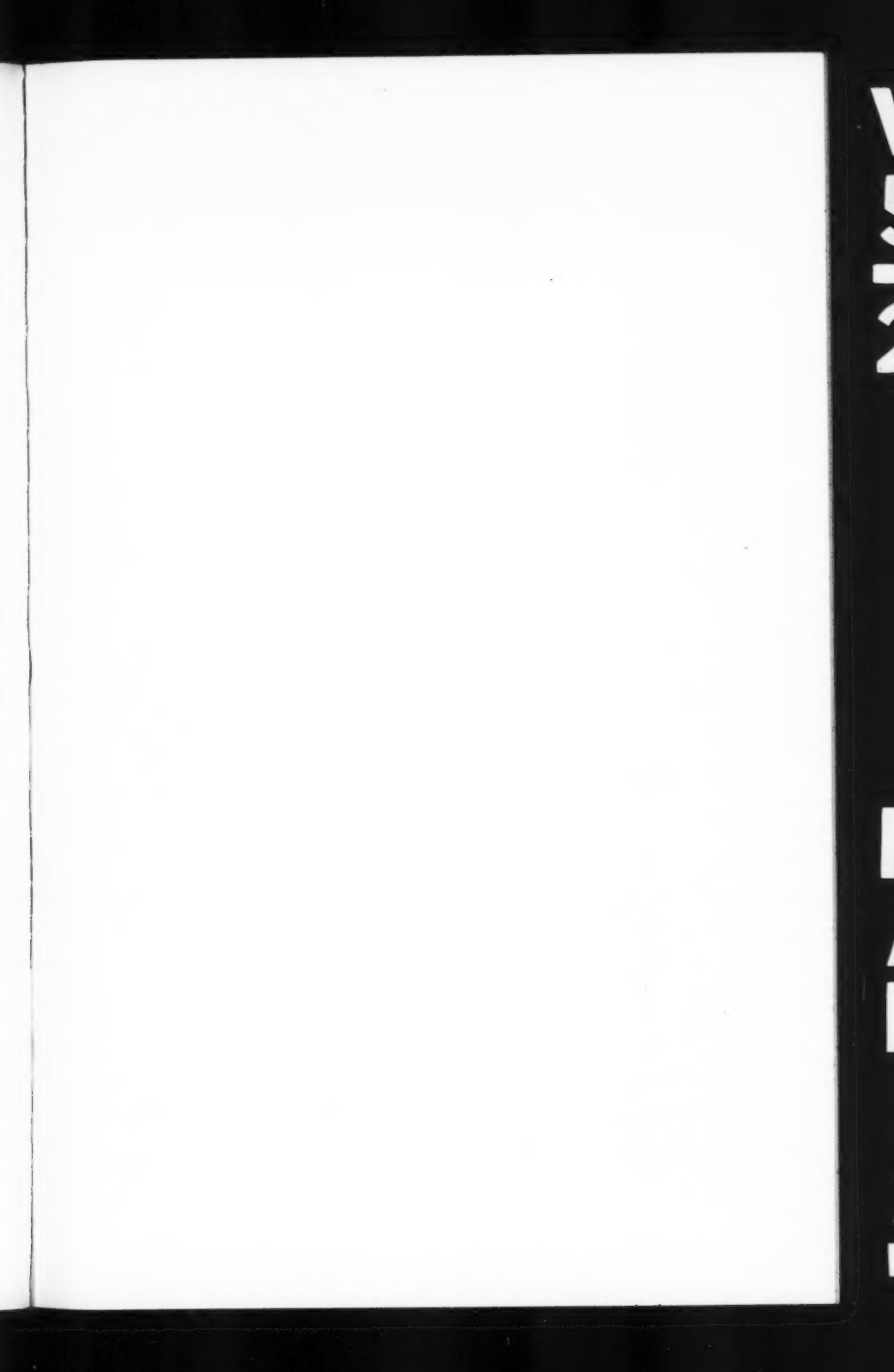
Described from Europe, and found in America in woods from New Brunswick to Alabama and west to Iowa and California. It was known under several binomials before a part of Vaillant's polynomial was taken up by Fries, but the problem is to find the earliest correct one. Even if *Agaricus bulbosus* Bull. were identical with this species, it is preceded by *Agaricus bulbosus* Schaeff., which is described and figured as having an evanescent volval limb. *A. stramineus* Scop. and *A. citrinus* Schaeff. both seem to apply to *A. Mappa* Fries, which is more or less in doubt. *Amanita verna* Pers., next in line, is based partly on Lamarck's *A. verna*, which is considered the same as *A. virosa* Fries, and partly on *Agaricus bulbosus vernus* Bull., a later name which coincides with our conception of *Amanita verna*. It therefore seems best to adhere for the present to the name assigned by Fries.

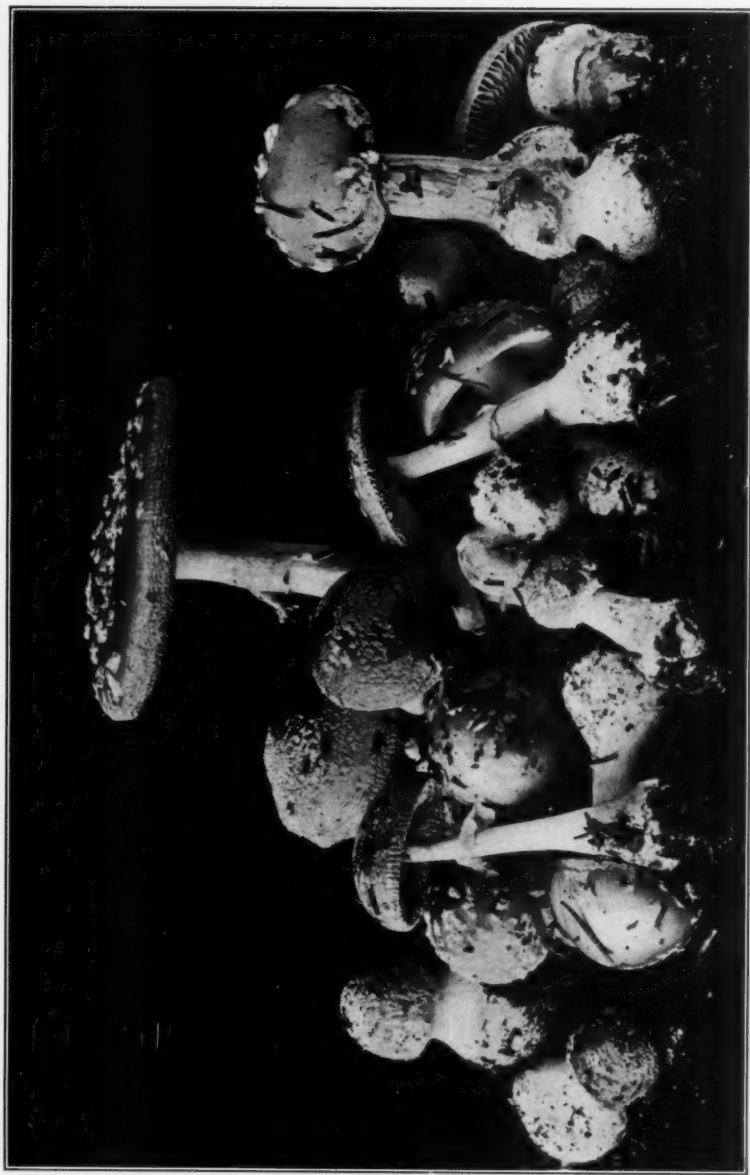
The species represents a strong, prevailing type, which assumes various forms and colors in different regions of its wide distribution, and to endeavor to keep them distinct would only confuse students and give them a wrong conception of species.

4. *VENENARIUS cothurnatus* (Atk.)

Amanita cothurnata Atk. *Stud. Am. Fungi* 66. f. 68-70. 1900.

Described from North Carolina, and found on the ground in woods in the eastern United States from New York to Alabama and west to Pennsylvania and Tennessee. Beardslee considers this species only a white form of *Amanita pantherina*.





VENENARIUS MUSCARIUS (L.) Earle

5. *Venenarius velatipes* (Atk.)

Amanita velatipes Atk. Stud. Am. Fungi 63. f. 64-67. 1900.

Known only from specimens collected in beech woods near Ithaca, New York. It resembles *A. pantherina*, but is larger.

6. *Venenarius rubens* (Scop.)

Agaricus rubens Scop. Fl. Carn. ed. 2, 2: 416. 1772.

Agaricus pustulatus Schaeff. Fung. Bav. 4: 39. pl. 91. 1774.

Agaricus myodes Schaeff. Fung. Bav. 4: 69. pl. 261. 1774.

Agaricus verrucosus Bull. Herb. Fr. pl. 316. 1786.

Amanita rubescens Pers. Syn. Fung. 254. 1801.

Amanita aspera Pers. Syn. Fung. 256. 1801.

Agaricus rubescens Fries, Syst. Myc. 1: 18. 1821. Not *Agaricus rubescens* Schaeff. 1774.

Agaricus asper Fries, Syst. Myc. 1: 18. 1821.

Agaricus magnificus Fries, Epicr. Myc. 10. 1838.

Described from Europe, and found in woods and groves from Maine to Alabama and west to Ohio. This species is said to have a white variety farther south, which was known to Schweinitz.

7. *Venenarius Morrisii* (Peck)

Amanita Morrisii Peck, Bull. N. Y. State Mus. 139: 42. 1910.

Described from Massachusetts, and occurring among mosses in swampy places in certain parts of that state.

8. *VENENARIUS MUSCARIUS* (L.) Earle, Bull. N. Y. Bot. Gard. 5: 450. 1909

Amanita muscaria Pers. Syn. Fung. 253. 1801.

Described from Europe, and occurring throughout temperate regions in woods and thickets. A pale form found on Long Island is considered by Peck to be closely related to white forms of *A. pantherina*, but to differ in volval characters. I have found small, pale forms under conifers in this vicinity, also a beautiful lemon-yellow form similar in every way to our usual northern orange form except in color. These color variations, together with the tendency of the stipe to be ocreate at times, may be quite confusing. The flesh of this species is said to be bitter, but I have not found it so, either in the fresh or dried state.

9. *Venenarius Frostianus* (Peck)

Agaricus muscarius minor Peck, Ann. Rep. N. Y. State Cab. 23: 69. 1872.

Agaricus Frostianus Peck, Ann. Rep. N. Y. State Mus. 33: 44. 1880.

Amanita flavoconia Atk. Jour. Myc. 8: 110. 1902. (Type from Freeville, New York.)

Described from New York, and found in woods from New Brunswick to Alabama and west to Wisconsin. Among the large number of specimens I have collected, very few are at all marginate or ocreate; in most of them the volva is friable and breaks up rather early. In Peck's first study of the species, he had one of these exceptional plants with a marginate bulb and laid more stress on this character in his description than later collections justified. The species is usually small, but I have found it at Lake Placid with the cap 7 cm. broad and the stem 13 cm. long. It often shows a fondness for decayed wood as a substratum. In collecting one summer at Mountain Lake, Virginia, nearly every specimen seen was growing in the remains of old logs, after the manner of *Russula emetica*.

10. *Venenarius flavorubescens* (Atk.)

Amanita flavorubescens Atk. Jour. Myc. 8: 111. 1902.

Described from Ithaca, New York, and reported also from Connecticut and Pennsylvania. This species appears commonly from June to September about New York City, under oaks on lawns or in thin woods, and I have had opportunities to study it closely. Its various forms have suggested *V. muscarius*, *V. rubens*, and *V. russuloides*. The color of the cap varies from flavous with a melleous tint to dark-brownish-melleous, and both the partial and the universal veil are flavous. The remains of the volva have usually mostly disappeared at maturity, but at times they are quite persistent. The base of the stipe is often somewhat enlarged, but is never rounded into a bulb. The characteristic tomentum on the stipe is rarely absent and may usually be relied upon in determining dried specimens.

11. *Venenarius russuloides* (Peck)

Agaricus (Amanita) russuloides Peck, Bull. Buffalo Soc. Nat. Sci. 1: 41. 1873.

Described from Greenbush, New York, and found in grassy ground in open woods or groves in New York and Massachusetts. According to Beardslee, it is not distinct from *Amanita junquillea* Quél., which, according to Boudier, is the same as *A. vernalis* Gill. and *A. Amici* Gill. The descriptions of *V. russuloides* and *A. junquillea* appear to be identical, except for the "tuberculate margin" of the former. Boudier's figures come nearer to representing our plant than do those of Quélet.

12. *Venenarius crenulatus* (Peck)

Amanita crenulata Peck, Bull. Torrey Club 27: 15. 1900.

Described from eastern Massachusetts, and known to occur in low shaded places in that part of the state. It resembles *V. russuloides* and *V. cothurnatus* in many ways, but the surface has a peculiar flocculent or webby covering similar to that of *V. muscarius*, and the base of the stipe is not ocreate.

13. *VENENARIUS SOLITARIUS* (Bull.) Murrill, Mycologia 4: 240. 1912

Agaricus solitarius Bull. Herb. Fr. pl. 48. 1780.

Agaricus solitarius Fries, Syst. Myc. 1: 17. 1821.

Agaricus strobiliformis Vitt. Fung. Mang. 59. 1835. (Type from Italy.)

Agaricus echinocephalus Vitt. Fung. Mang. 346. 1835. (Type from Italy.)

Agaricus polypyraxis B. & C. Ann. Nat. Hist. II. 12: 417. 1853. (Type from South Carolina.)

Agaricus monticulosus B. & C. Ann. Nat. Hist. II. 12: 418. 1853. (Type from South Carolina.)

Agaricus Ravenelii B. & C. Ann. Nat. Hist. III. 4: 284. 1859. (Type from South Carolina.)

Agaricus muscarius major Peck, Ann. Rep. N. Y. State Cab. 23: 69. 1872.

Agaricus (Amanita) onustus Howe, Bull. Torrey Club 5: 42. 1874. (Type from New York.)

- Agaricus (Amanita) chlorinosmus* Peck in Austin, Bull. Torrey Club **6**: 278. 1878. (Type from Closter, New York.)
- Amanita candida* Peck, Bull. Torrey Club **24**: 137. 1897. (Type from Alabama.)
- Amanita prairiicola* Peck, Bull. Torrey Club **24**: 138. 1897. (Type from Kansas.)
- Amanita multisquamosa* Peck, Ann. Rep. N. Y. State Mus. **53**: 840. 1900. (Type from New York.)
- Amanita radicata* Peck, Bull. Torrey Club **27**: 609. 1900. (Type from New Jersey.)
- Amanita cinereoconia* Atk. Ann. Myc. **7**: 366. 1909. (Type from Chapel Hill, North Carolina.)

Described from Europe, and known in the United States from New York to Alabama and west to California, growing either in open ground or in thin woods. The species is very variable and has been much discussed under a variety of names, some of them older than the ones here listed. A number of other synonyms might be added.

The variations appear in several characters and are conspicuous. The color is usually white, but varies to yellowish, cinereous, gray, or murinous. The surface may be pulverulent, or adorned with flat, gemmate, or spiny scales, which sometimes persist and at other times disappear and leave the surface glabrous. The veil usually tears into shreds, but may persist as an ample annulus. The volva is usually fragile like the veil, but cup-shaped or ocreate forms occur. The base of the stipe may be bulbous, or enlarged and radicate, or slender and radicate. The spores are ellipsoid, but vary much in size, some measurements being as low as $7-10 \times 5-7 \mu$ and others reaching $12-14 \times 7-9 \mu$. Even the peculiar odor noted in some specimens and described as resembling that of chlorine, chloride of lime, or nitric acid, is definitely stated by responsible collectors to be entirely absent in many cases.

We have represented in this species one of those widely distributed and prevailing types in which variation has run riot, to the confusion of the student and the amazement of the specialist. It would be well if some advanced student or investigator could devote his attention to the morphology of these various forms, studying them as a group, and endeavor to determine the lines

and limits of variation, as well as some of the causes that have operated to produce the forms as we now know them.

DOUBTFUL SPECIES

This list includes species that have not been sufficiently studied by the writer, or species imperfectly known by mycologists generally.

Amanita abrupta Peck, Bull. Torrey Club 24: 138. 1897. Known only from specimens collected by Underwood and Baker in woods near Auburn, Alabama. It is near *Venenarius solitarius*, but the slender stipe terminated below by a large subglobose bulb distinguishes it from the forms of that species with which I am familiar. It is very desirable that fresh specimens be obtained and color sketches or photographs be made from them for comparison with *V. solitarius* and *V. cothurnatus*.

Amanita elliptosperma Atk. Ann. Myc. 7: 336. 1909. Described from Chapel Hill, North Carolina. Resembling white forms of *Venenarius phalloides*, but said to have ellipsoid spores. The dried specimens are similar to those of *Amanita verna*.

Amanita elongata Peck, Bull. N. Y. State Mus. 131: 33. 1909. Described from specimens collected by Sterling in Pennsylvania, July, 1907, on damp grassy ground in the borders of woods. Resembling *Vaginata albocreata*, but having a well-developed annulus. From yellow forms of *Venenarius phalloides*, it differs in its very long, slender stipe and the absence of a free limb to the volva. In color and general appearance, except the long stipe, it greatly resembles *Venenarius Frostianus*. Further field studies are highly desirable.

Amanita flavorubens B. & Mont. Syll. Crypt. 96. 1856. Described from Columbus, Ohio, and reported also from West Virginia. Very near *Venenarius rubens*.

Amanita glabriceps Peck, Bull. N. Y. State Mus. 131: 18. pl. U. 1909. Described from Coopers Plains, New York, and known also from one other locality in the state. Pileus white or yellowish-white, often striate on the margin; stipe long, glabrous or floccose-squamulose, bulbous; volva circumscissile, slightly marginate; spores globose, 8 μ . Dr. Peck states that this species is closely related to *Venenarius phalloides*.

Amanita magnivelaris Peck, Ann. Rep. N. Y. State Mus. 50: 96. 1897. Described from Port Jefferson, New York, and said by the author to differ from *Amanita verna* in its large, persistent annulus; its elongate, downwardly tapering bulb; and especially in its ellipsoid spores.

Amanita submaculata Peck, Bull. Torrey Club 27: 609. 1900. Known only from a single specimen, accompanied by a sketch, sent to Dr. Peck from North Carolina by Miss Wilson, who, pronouncing it edible, must have collected more than one sporophore. If it had not been pronounced edible, I should be inclined to classify it as a dark-centered form of *Venenarius phalloides*, in which most of the volva had been carried up on the surface of the cap. The type is sterile, and further field study of the plant is highly desirable.

EUROPEAN SPECIES REPORTED IN AMERICA

A number of names are current in America that evidently apply only to European species. Some of these may turn out to be European varieties of species common to both countries.

AGARICUS EXCELSUS Fries, Syst. Myc. 1: 17. 1821

This is not distinct from *Amanita ampla* Pers., according to Boudier.

Venenarius junquilleus (Quél.)

Amanita junquillea Quél. Bull. Soc. Bot. Fr. 23: 324. pl. 3. f. 10. 1876.

It is the opinion of some mycologists that this is not distinct from *Venenarius russuloides*.

AGARICUS NITIDUS Fries, Obs. Myc. 1: 4. 1815

A mixture of *Amanita citrina alba* Pers. and *Agaricus strobiliformis* Vitt., according to Boudier.

Venenarius pantherinus (DC.)

Agaricus maculatus Schaeff. Fung. Bav. 4: 39. pl. 90. 1774. Not

Agaricus maculatus Scop. 1772.

Agaricus pantherinus DC. Fl. Fr. 6: 52. 1815.

Described from France, and found in woods and groves throughout Europe and parts of Asia. I have been unable to find any typical specimens from this country. In the case of *V. phalloides*, we have white and dark forms abundantly represented, and it would seem natural to expect the dark forms of *V. pantherinus* also if the species occurs here. Beardslee has studied *V. cothurnatus* in North Carolina and *V. pantherinus* in Sweden, and he believes the two to be identical. He found the spores of both species to be globose in fresh specimens, changing to ellipsoid after the dried plants were kept for several weeks. *Amanita umbrina* Pers. Syn. Fung. 254. 1801 refers to the usual dark European form of this species. DeCandolle evidently did not use Persoon's name in *Agaricus* because it was preoccupied in that genus.

Venenarius porphyrius (Fries)

Agaricus porphyrius Fries, Syst. Myc. 1: 14. 1821.

Described from Europe, and reported by Beardslee from North Carolina. It is near *V. phalloides*, but the annulus becomes sooty-black with age or on drying.

Venenarius recutitus (Fries)

Agaricus recutitus Fries, Epicr. Myc. 6. 1838.

Specimens of *Venenarius spretus* have been referred to this species in America.

Venenarius spissus (Fries)

Agaricus spissus Fries, Epicr. Myc. 9. 1838.

AGARICUS VIROSUS Fries, Epicr. Myc. 6. 1838

This species has often been confused with white forms of *Venenarius phalloides*, from which it is said to differ in its strong odor and rough stipe.

VAGINATA (Nees) S. F. Gray, Nat. Arr. Brit. Pl. 1: 601. 1821

Amanitopsis Roze, Bull. Soc. Bot. Fr. 23: 50. 1876.

This genus is distinguished from *Venenarius* by the absence of

a veil. Because of the usually prominent sheath or volva in species of both genera, it was formerly customary to regard them as belonging to the same genus, and to speak of them all as "Amanitas."

Volva membranous, free; stipe not bulbous.

Volva narrow, closely sheathing the stipe.

Volva elongate, persistent; lamellae white; pileus variously colored.

1. *V. plumbea*

Volva short, rather friable; lamellae lemon-yellow; pileus orange-red.

2. *V. parvicolvata*.

Volva wide, not sheathing; pileus dull-white to yellowish, rarely reddish-brown, usually floccose or scaly.

3. *V. agglutina* a.

Volva membranous, adnate to the base of the bulbous stipe, limb free.

Stipe less than 3 cm. long; pileus pale-brown.

4. *V. pusilla*.

Stipe much longer; pileus white or yellowish.

5. *V. albocreata*.

Volva fragile, adnate to the pileus and stipe in the form of squamules or patches.

Pileus mealy or densely floccose; less than 5 cm. broad.

6. *V. farinosa*.

Pileus decorated with few or many patches; usually more than 5 cm. broad.

V. plumbea strangulata.

1. *Vaginata plumbea* (Schaeff.)

Agaricus plumbeus Schaeff. Fung. Bav. 4: 37. pl. 85, 86. 1774.

Agaricus fulvus Schaeff. Fung. Bav. 4: 41. pl. 95. 1774.

Agaricus hyalinus Schaeff. Fung. Bav. 4: 63. pl. 244. 1774.

Agaricus badius Schaeff. Fung. Bav. 4: 63. pl. 245. 1774.

Agaricus vaginatus Bull. Herb. Fr. pl. 98. 1782.

Amanita livida Pers. Syn. Fung. 247. 1801.

Amanita spadicea Pers. Syn. Fung. 248. 1801.

Vaginata livida S. F. Gray, Nat. Arr. Brit. Pl. 1: 601. 1821.

Amanitopsis vaginata P. Karst. Hattsv. 1: 6. 1879.

Vaginata vaginata Murrill, Mycologia 3: 80. 1911.

Described from Bavaria, and occurring very commonly in woods and groves from Greenland to Alabama and west to Oregon and California; also sparingly in the northern Bahamas and the mountains of Jamaica. A number of names have been assigned to the various forms and colors of the plant by European mycologists. That assigned by Schaeffer to the common gray variety appears to be the earliest.



VAGINATA AGGLUTINATA (Berk. & Curt.) O. Kuntze

2. *Vaginata parcovolvata* (Peck)

Amanitopsis parcovolvata Peck, Bull. Torrey Club 27: 610. 1900.

Amanita muscaria coccinea Beardslee, Jour. Elisha Mitchell Soc.

1: 8. 1902.

This beautiful species, known to occur in thin woods from New Jersey to North Carolina, has a brilliant orange-red cap, lemon-yellow gills, and a lemon-yellow, pulverulent stem terminated by a short, friable volva. The writer found it under oaks at Blacksburg, Virginia, July, 1910, and compared it carefully with the white, yellow, gray, and blackish forms of *V. plumbea* common in that region. I have not examined Beardslee's specimens, but do not see how they can be distinct.

3. *VAGINATA AGGLUTINATA* (Berk. & Curt) O. Kuntze, Rev. Gen.

3: 539. 1893

Agaricus agglutinatus Berk. & Curt. Hook. Jour. Bot. 1: 97. 1849. (Type from South Carolina.)

Agaricus volvatus Peck, Ann. Rep. N. Y. State Mus. 24: 59. 1872. (Type from Greenbush, New York.)

Agaricus soleatus Howe, Bull. Torrey Club 5: 42. 1874. (Type from Yonkers, New York.)

Amanitopsis agglutinata Sacc. Syll. Fung. 5: 23. 1887.

Amanitopsis volvata Sacc. Syll. Fung. 5: 23. 1887.

Apparently rare in the warmer parts of temperate Europe and common in the eastern United States, occurring in open woods and wood borders from New England to Alabama and west to Ohio. It varies very much in size, and its surface may be entirely glabrous, or adorned with a few large patches from the volva, or covered with powder much as in *V. farinosa*. The usual color is dull-white or yellowish, but forms with the surface reddish-brown at the center or entirely reddish-brown are found at times. According to Bresadola, *A*—— *Barlae* Quél. refers to this species, and some think it should be known as *Amanitopsis baccata* (Fries) Sacc.

4. *Vaginata pusilla* (Peck)

Amanitopsis pusilla Peck, Ann. Rep. N. Y. State Mus. 50: 96. 1898.

Known only from three small sporophores collected by Mrs. Anthony in grassy ground at Gouverneur, New York, in September. The cap is pale-brown when fresh and the gills become brownish. The dried specimens are now not easy to compare, but I cannot definitely connect them with any other known species.

5. *Vaginata albocreata* (Atk.)

Agaricus nivalis Peck, Ann. Rep. N. Y. State Mus. 33: 48. 1883.

Not *Agaricus nivalis* Grev. 1823.

Amanitopsis albocreata Atk. Jour. Myc. 8: III. 1902.

This species is represented by a number of specimens in the Cornell University Herbarium, and at Albany the peculiar volval differences between it and *V. plumbea alba* are well shown. It is reported from New York to Alabama.

6. *VAGINATA FARINOSA* (Schw.) Murrill, Mycologia 4: 3. pl. 56.
f. 5. 1912

Amanita farinosa Schw. Schr. Nat. Ges. Leipzig 1: 79. 1822.

Amanitopsis farinosa Atk. Stud. Am. Fungi 76. 1900.

Described from North Carolina, and found in open deciduous woods from New York to Alabama.

DOUBTFUL AND EUROPEAN SPECIES

Amanitopsis adnata (W. G. Sm.) Sacc. Syll. Fung. 5: 24. 1887. Described from England, and reported from this country by Morgan, Harkness, and others. I have seen no American specimens that could be so referred.

Agaricus baccatus Fries, Epicr. Myc. 12. 1838. Founded on Micheli's plate 80, figure 4, accompanied by a brief description. The warts on the pileus are too evenly distributed, and the volva is too small and circumscissile to suggest our *Vaginata agglutinata*. If an annulus were present, the figure might suggest white forms of *Venenarius pantherinus*.

Agaricus daucipes B. & Mont. Syll. Crypt. 96. 1856. Described from Sullivant's collections at Columbus, Ohio, and placed by Saccardo in *Amanitopsis* although the description expressly

mentions the presence of a veil. Other parts of the description, such as the "radicate stipe" and the "warty pileus" make it pretty clear that the plant is only a form of *Venenarius solitarius*.

Amanitopsis hyperborea P. Karst. Hattsv. 1: 7. 1879. Reported from Greenland by Rostrup (Med. Groenl. 3: 528. 1888), but I have not seen it among American collections.

Agaricus praetorius Fries, Epicr. Myc. 11. 1838. Specimens of *Venenarius Caesareus* from America have been referred to this species.

Amanitopsis pubescens Sacc. Syll. Fung. 5: 25. 1887. *Amanita pubescens* Schw. Schr. Nat. Ges. Leipzig 1: 79. 1822. Described from specimens collected in grassy places in North Carolina. Schweinitz said it was rare, and Morgan, Beardslee, and others say that it has not been collected since his time. The description might suggest *Vaginata farinosa* or *Vaginata agglutinata*, but Schweinitz certainly knew the former and the volva of the latter could not be characterized as "vanishing." Some forms of *Venenarius solitarius* might be thought of, but none of them are quite small enough.

Amanitopsis pulverulenta Peck, Bull. N. Y. State Mus. 116: 17. 1907. Described from plants collected by Peck on shaded roadside banks at Port Jefferson, New York, August, 1906. There are two boxes of specimens at Albany. One contains a single specimen having a long, pulverulent stipe, with bulbous base and no volva, and the pileus covered, except at the center, with a fine powder as in *Lepiota cretacea*. The other box contains several specimens, evidently the types, with short, often radicate, stems and caps that are sometimes gemmate. These latter plants are certainly *Venenarius solitarius*, and there is little doubt that the species belongs in that category.

Amanitopsis strangulata (Fries) P. Karst. Hattsv. 1: 7. 1879. *Agaricus strangulatus* Fries, Epicr. Myc. 6. 1838. Much has been written about this species. Beardslee has recently studied it in Sweden and considers it distinct from *Vaginata plumbea*, being more robust and with an entirely different kind of volva. Boudier is of the same opinion. Fries's description in the *Epicrisis* and Battarra's plate call for an annulus, while Fries's later description and figure refer to the plant as we now know it. If

the plant is distinct, it must have another name, selected from such synonyms as *Agaricus Ceciliae* B. & Br., or *Agaricus inan-ratus* Secr. In America, it is reported from New England to Alabama and west to Wisconsin. Variations occur all the way from the entire sheath of *V. plumbea* to the extreme form in which the volva is broken into small particles and distributed on the surface of the cap. I will admit that this extremely friable form of the volva is puzzling, but, after all, it is difficult to separate it specifically from the livid form of *V. plumbea*. Lucand has figured a specimen of *V. plumbea* in his group of *A. strangulata*. Did he get the plants mixed, or is this another indication that they are not distinct species?

NEW YORK BOTANICAL GARDEN.

NEWS AND NOTES

Dr. Adeline Ames has been appointed assistant forest pathologist in the Bureau of Plant Industry at Washington.

Mr. E. L. Morris, of the Brooklyn Institute of Arts and Sciences, was elected editor-in-chief of the publications of the Torrey Botanical Club at the annual meeting held January 14.

Dr. Neil E. Stevens, formerly pathologist at the Kansas Agricultural Experiment Station, has been appointed forest pathologist in the Bureau of Plant Industry at Washington.

Professor B. M. Duggar, formerly of the College of Agriculture at Cornell University, has recently been appointed physiologist at the Missouri Botanical Garden and has charge of the graduate laboratory.

Dr. Anton R. Rose, formerly of the department of biological chemistry of Columbia University, has been employed by the New Jersey Agricultural Experiment Station to carry on investigations bearing on the relation of tannin to the chestnut blight.

Hiltner has recently treated chlorosis in fruit-trees and vines (*Prakt. Bl. Pflanzbau u. Schutz* 10: 49-51. 1912) by introducing iron and other elements in soluble form through holes bored into the trunks.

A bacterial disease of walnut trees in Tasmania is reported and described by L. Rodway (*Agr. Gaz. Tasmania* 20: 85, 86. 1912) as appearing on the nuts and leaves in small black spots and so weakening the tree that death results in a few years.

Under the title "Remarks on Some Species of the Genus *Polyporus*" (Sv. Bot. Tidsk. 6: 635-644. 1912), Romell discusses fourteen Swedish species, two of them, *P. albo-sordescens* and *P. rufopodex*, under new names. Several of the species are figured.

Dr. Charles Horton Peck, our distinguished state botanist, located at Albany, New York, will be eighty years old on March 30. His numerous mycological friends will no doubt extend their hearty congratulations and wish him many happy returns of the day. Dr. Peck has been faithfully serving the state since 1867, almost fifty years.

Professor Ellsworth Bethel has been granted leave of absence for five weeks from his position in the East Denver High School and will spend the time collecting in Costa Rica, Guatemala, and other parts of Central America. He sailed from New Orleans on February 26 for Panama.

Gnomonia Caryae, the perfect stage of *Glocosporium Caryae* Ellis & Dearness, was described by Frederick A. Wolf in the October number of *Annales Mycologici*. This is thought to be the first attempt to connect *Glocosporium Caryae* with its perfect stage and the species is described as new, although close to *Gnomonia setacea macrospora*, which also occurs on fallen leaves of hickory.

At the recent Cleveland meeting, the following officers were elected by the American Phytopathological Society for the current year: F. C. Stewart, president; Haven Metcalf, vice-president; C. L. Shear, secretary-treasurer; W. J. Morse, councilor. The next meeting will be held in Atlanta.

An illustrated paper by H. O. Juel on *Taphrina* and *Exobasidium* (Sv. Bot. Tidsk. 6: 353-372. 1912) deals particularly with species of *Taphrina* occurring on birch in the neighborhood

of Abisko, and with the Scandinavian species of *Exobasidium* growing on the Ericaceae. *Taphrina lapponica*, on *Betula odorata*, is described as new.

C. Wehmer has experimented for some time with dry rot caused by *Merulius lacrymans* (Myc. Centralbl. 1: 138-148, 166-174. 1912) and he has found that the growth of this fungus in cultures may be hindered or stopped by the addition of 0.5 to 5 per cent. tannic acid, and that pine wood may be protected by a 1 to 2 per cent. solution.

The October number of *Annales Mycologici* contains an article on the fungi of the soil by Elizabeth Dale, of Girton College, Cambridge. More than thirty species distributed among twenty genera were obtained from two samples of soil taken from plots on the Royal Agricultural Society's farm at Woburn. The results of similar studies made in this country show a striking similarity to those made in England.

According to the investigations of A. W. Drost, the Panama disease of the Jamaica banana is caused by the fungus *Leptospora Musae* and the disease was present in Surinam before this banana was introduced. The fungus lives in the ground for a long time and has been found to attack different varieties of banana, so that soil once infected with the fungus becomes unfit for banana culture.

Mr. C. R. Orton, for the last year and a half assistant in botany at the Indiana Experiment Station, resigned on January 1 to become plant pathologist and assistant professor of botany in the Pennsylvania State College. Mr. Orton was engaged in the investigation of plant rusts while at the Indiana Station. His place will be temporarily filled by Mr. J. B. Demaree, who recently resigned his position as assistant in botany at the Ohio Experiment Station.

A number of papers on the identity and relationships of the fungus causing the chestnut canker have recently appeared in *Phytopathology* and *Science* under the authorship of P. J. Anderson and H. W. Anderson, Clinton, Farlow, Shear, and others. It is not necessary to give abstracts of these papers here, as they are readily available in the original. A brief foreign paper by Pantanelli, however, which has just appeared (*Rend. Accad. Lincei* 21: 869-875. 1912), is important and interesting as bearing on the supposed European origin of the chestnut canker. After a careful comparison of the Italian and American species in question as to their morphological characters, cultural characters, habitat, and parasitism, the author concludes that *Diaporthe parasitica* Murrill [*Endothia parasitica* (Murr.) Anderson] is distinct from *Endothia radicalis* (Schw.) Fries, and, moreover, cannot possibly be of European origin.

Efforts to eradicate or check the chestnut canker are still in progress, and it is hoped that careful scientific experimentation with this disease will aid greatly in the control of less virulent fungous diseases of trees in the future. Mr. Roy R. Pierce, of the Pennsylvania Chestnut Tree Blight Commission, has recently outlined a treatment for ornamental or cultivated chestnut trees that are only slightly affected. This consists in carefully removing the cankers to the depth of six annual rings of wood and painting the wounds with coal-tar containing creosote; then, in order to prevent further infection, spraying the entire tree very thoroughly with strong bordeaux mixture (4: 5: 50). The merit of this treatment is that it is theoretically and scientifically "correct" and that it comes as near to control as anything yet suggested. Speaking *practically*, however, trees covered continuously with copper sulfate and lime do not fit very well into a gorgeous landscape scheme, especially if they are liable to drop a limb or two every few months or to drop out entirely some time while the owner is asleep; and owners of chestnut orchards, who are presumably commercially inclined, are not apt to continue very long a losing fight against a dreaded disease when other equally inviting and far safer fields are open to them.

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